

# *CONSTRUCTORS/DESTRUCTORS IN JAVA*

**Prof. Chris Jermaine**  
**cmj4@cs.rice.edu**

# Constructors/Destructors in Java

- All about allocating resources before an object is used
- And freeing resources when an object is done
- Will cover constructors first
  - Which are done right in Java and make a lot of sense
- And then cover destructors
  - Which are not and don't

# Constructors

- We've seen 'em
  - Code that gets automatically called when memory for an object is allocated
- But we'll discuss in a bit more detail

# Default Values

- At object allocation

- Java assigns each member var its default value

- If you want, you can give an explicit initialization

```
class Foo {  
    private int a = 12;  
    private IDoubleVector b = new DenseDoubVector (2, 0);  
    private double c;  
    ...  
}
```

- Initialized in order of declaration

- And initialized before any constructor code is executed

- Note: statics only initialized once, at first creation of object of that type

# Providing Initialization Code

- Can have a block of code that is always run before constructor

```
class Foo {
    int a;
    {
        System.out.println ("This code'll run before the");
        System.out.println ("constructor.");
    }
    Foo () {
        System.out.println ("Here is the constructor.");
    }
}
...
Foo bar = new Foo ();
```

- What does this do?
- Note: can have block labeled “static”... what happens then?

# Calling Superclass Constructors

- The default (no-param) superclass const. is automatically called
  - Invoked before anything else is done to the subclass
  - This can cause a chain of invocations, all the way back to “Object”
  - If you want another constructor, use call to “super”
  - Must be the first statement in a named constructor

```
class Foo extends Bar {  
    {  
        System.out.println ("Hi mom!");  
    }  
    Foo () {  
        super (2);  
        System.out.println ("Here is the constructor.");  
    }  
} ...  
Foo bar = new Foo ();
```

- What does this do?

# I Think Java Does This Just About Right

- Except that there's no really easy way to force a subclass...
  - To call a particular, parameterized constructor

- Ex:

```
class AChecker {  
    private int xPos;  
    private int yPos;  
    protected AChecker (int initX, int initY) {}  
}
```

```
class BlackChecker extends AChecker {  
    public BlackChecker () {  
        System.out.println ("I screwed, up, why?");  
    }  
}
```

- What's the best thing you can do here to prevent problems?

# Destructors

- A “destructor” is a piece of code called when an object dies
- One weird thing about Java
  - It lacks destructor support in the language
  - Does have “finalize()” inherited from “Object”, but that’s something else
  - I couldn’t believe this when I first learned Java...
- Why did the Java leave out destructors?

# Destructors

- A “destructor” is a piece of code called when an object dies
- One weird thing about Java
  - It lacks
  - Does have “finalize()” inherited from “Object”, but that’s something else
  - I couldn’t believe this when I first learned Java...
- Why did the Java leave out destructors?
  - Presumably, they thought, “Java’s garbage collected”...
  - Destructors are for writing code that frees memory when an object is dead
  - So we don’t need them!
- What’s wrong with this argument?

# Destructors

- A “destructor” is a piece of code called when an object dies
- One weird thing about Java
  - It lacks
  - Does have “finalize()” inherited from “Object”, but that’s something else
  - I couldn’t believe this when I first learned Java...
- Why did the Java leave out destructors?
  - Presumably, they thought, “Java’s garbage collected”...
  - Destructors are for writing code that frees ~~memory~~ when an object is dead
  - So we don’t need them! **Not true!** **Resources**
- What’s wrong with this argument?
  - Local memory is not the only resource! What are some others?

# Destructors

- A “destructor” is a piece of code called when an object dies
- One weird thing about Java
  - It lacks
  - Does have “finalize()” inherited from “Object”, but that’s something else
  - I couldn’t believe this when Scott first told me...
- Why did the Java leave out destructors?
  - Presumably, they thought, “Java’s garbage collected”...
  - Destructors are for writing code that frees ~~memory~~ when an object is dead
  - So we don’t need them! **Not true!** **Resources**
- What’s wrong with this argument?
  - Local memory is not the only resource! What are some others?
  - Secondary storage, server connection, network connection, device driver memory

# So What Does a Good Programmer Do?

- Lack of a destructor is an attack on encapsulation!
- Why? You suddenly have to worry...
  - Does this class have to deal with freeing some resource?
  - When that resource might be unimportant to the class' interface!
  - If so, make sure to call “freeResource” routine
  - Example of commonly suggested workaround:

```
NetworkConnection temp;  
try {  
    .... // code that deals with temp here  
} finally {  
    temp.freeResource ();  
}
```

- Java 7 even has a “try-with-resources” shortcut for this

## But Even This Is Not Very Good

```
NetworkConnection temp = new NetworkConnection ();  
try {  
    .... // code that deals with temp here  
} finally {  
    temp.freeResource ();  
}
```

- What's the problem?

## But Even This Is Not Very Good

```
URLConnection temp = new Connection ();
try {
    .... // code that deals with temp here
} finally {
    temp.freeResource ();
}
```

- What's the problem?
  - What if inside the “try” code you create a reference to “temp”?
  - No easy way to deal with this, except to be careful, and never alias a resource
  - OR could eschew aliases entirely (but that's not the “Java way of programming”)
- It's easy for me to stand here and be snarky
  - And complain about Java (why not just admit failure, add a real destructor?)
  - But this is a very serious issue
  - Only way around it is being as careful as possible with resources!

# Final Note

- What's up with “Object.finalize ()”?
  - Called by garbage collector “if and when” JVM determines no more references
- After call to “finalize”, JVM can discard the object
- But no guarantees. This code never prints “done” on my machine:

```
class Bar {
    Bar () {
        System.out.println ("new Bar!");}
    protected void finalize () {
        System.out.println ("done");}
}
...
public static main (String [] args) {
    System.out.println ("Inside main.");
    Bar x = new Bar ();
}
```

Questions?